Ash

White ash, *Fraxinus americana*
Black ash, *Fraxinus nigra*
Green ash, *Fraxinus pennsylvanica*

The volume of ash has increased steadily as have average growth rates. **Low mortality** is reflected in a below average ratio of mortality to growth. The number of seedlings and saplings has increased significantly suggesting that, for now, regeneration is adequate.

This situation may change, however, as the **emerald ash borer** (EAB), a major cause of ash mortality, arrived in Wisconsin in 2009 and is expected to cause substantial mortality of ash.

Ash is **not a major roundwood species** but is used for pulpwood, sawlogs and fuelwood production. Ash biomass has a higher density than average and may serve as a source for biofuel production, especially if mortality from EAB creates the opportunity for salvage harvesting.

- *How has the ash resource changed?*
  Growing stock volume and diameter class distribution: 1983, 1996, and 2008
- *Where does ash grow in Wisconsin?*
  Growing stock volume by region with map
- *How fast is ash growing?*
  Average annual net growth by region and year: 1983, 1996, and 2008
- *How healthy is ash in the state?*
  Average annual mortality by year: 1983, 1996, and 2008
- *How much ash do we harvest?*
  Roundwood production by product: 1997, 2003, and 2006
- *How much is ash selling for?*
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- *How much ash biomass do we have?*
  Oven-dry tons by region of the state

"How has the ash resource changed?"

Growing stock volume and diameter class distribution by year

The growing stock volume of ash in Wisconsin (Chart 1) was about 1.3 billion cubic feet in 2008, accounting for 6% of total growing stock volume. This represents an increase of about 74% since 1983.

Like many other species, the ash resource is maturing. For growing stock trees, volume in large trees (over 13 inches in diameter) has almost tripled since 1983, whereas volume in smaller trees (under 13 inches) has increased by only 46% (Chart 2).

Seedling and sapling size trees are increasing in number for all three ash species (Chart 3), suggesting that, in the absence of high mortality due to emerald ash borer, ash would maintain its important role in Wisconsin's forests.

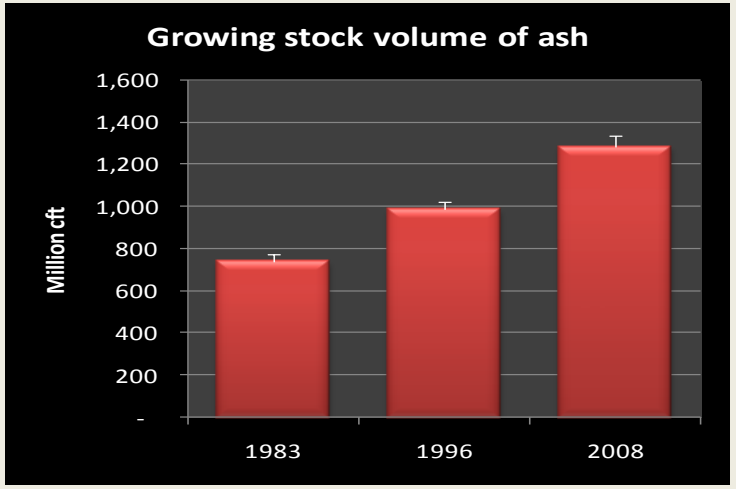


Chart 1. Growing stock volume (million cubic feet) by inventory year.
Source: USDA Forest Inventory and Analysis data: 1983, 1996, and 2008.

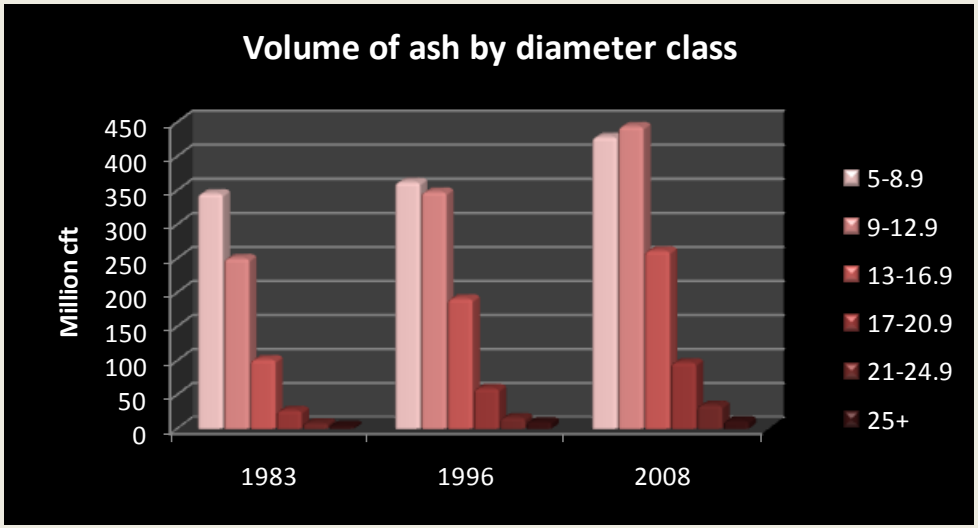


Chart 2. Growing stock volume (million cubic feet) in 1983, 1996, and 2008.
Source: USDA Forest Inventory and Analysis data: 1983, 1996, and 2008.

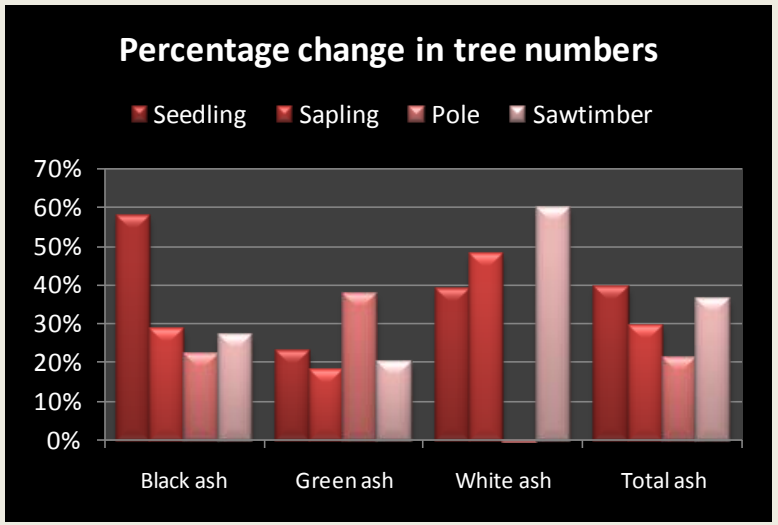
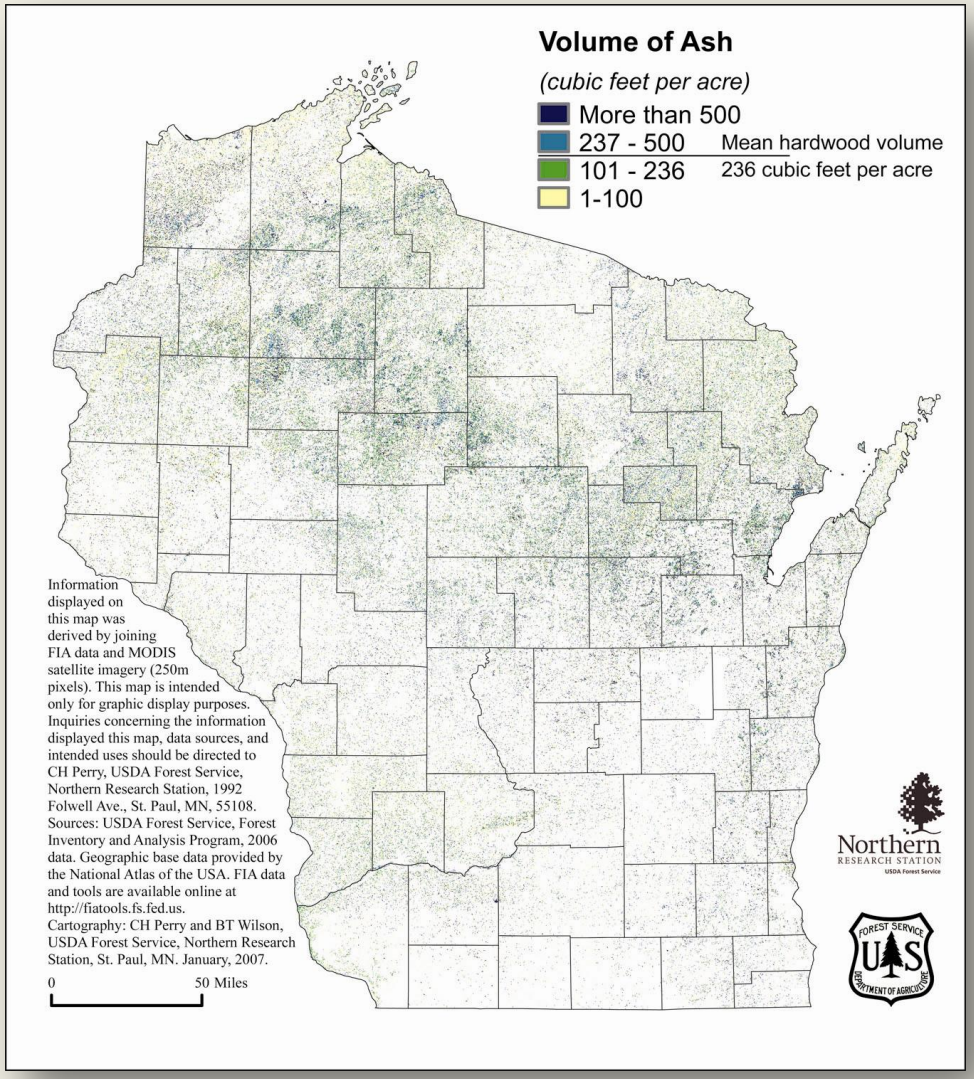


Chart 3. Percentage change in the number of live trees by size class between 1996 and 2008.
Source: USDA Forest Inventory and Analysis data: 1983, 1996, and 2008.

"Where does ash grow in Wisconsin?"

Growing stock volume by region with map



Almost 60% of ash volume is located in northern Wisconsin with another 28% in the southern part of the state (Table 1).

Black ash occurs mainly in the northwest and on bottomland hardwood forest types. Green ash also prefers wetter sites but is more of a southern species. White ash, on the other hand, prefers drier soils and is found mostly on maple-basswood forest types and, to a lesser extent. on oak-hickorv.

Table 1. Growing stock volume (million cft) by species and region of the state.

Species	Central	North east	North west	South east	South west	Total	% of total
Black Ash	73	99	318	41	22	553	**43%**
Green Ash	52	57	58	142	26	336	**26%**
White Ash	62	115	88	64	69	398	**31%**
Total	**187**	**271**	**464**	**247**	**117**	**1,286**	**100%**
% of total	**15%**	**21%**	**36%**	**19%**	**9%**	**100%**	

Source: USDA Forest Inventory and Analysis data 2008

Additional tables:

Volume by county in 2008 (pdf; Excel)

"How fast is ash growing?"

Average annual net growth by region and year

Average annual net growth of ash (Chart 4) was about 43.8 million cubic feet per year from 2004 to 2008, corresponding to 7.5% of total tree growth in Wisconsin in that period. This represents an increase of about 68% over the last 23 years, mainly due to aging trees.

The highest volume growth for ash is in the northwest due to the prevalence of black ash in this region (Table 2). As a percentage of volume, however, the highest growth rate is in the southwest.

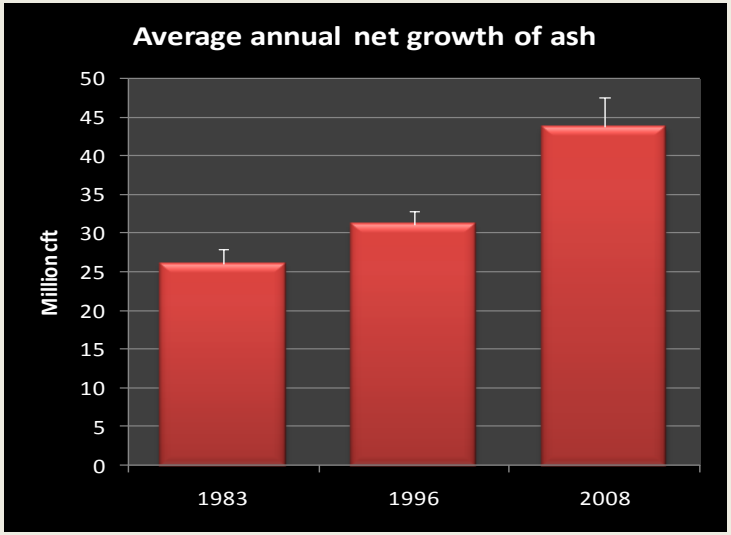


Chart 4. Average annual net growth (million cubic feet).
Source: USDA Forest Inventory & Analysis data: 1983, 1996, 2008

Table 2. Average annual net growth (million cft/year) and ratio of growth to volume by region of the state (2004 to 2008).

Region	Net growth	Percent of total	Ratio of growth to volume
Central	7.0	16%	3.7%
Northeast	8.0	18%	3.0%
Northwest	12.3	28%	2.6%
Southeast	9.8	22%	4.0%
Southwest	6.7	15%	5.7%
Statewide	**43.8**	**100%**	**3.4%**

Source: USDA Forest Inventory & Analysis data: 2008

The average ratio of growth to volume for ash is 3.4%, higher than the statewide average of 2.8% for all species and is exceeded only by red pine and white pine.

Additional tables:
Average annual growth, mortality and removals by region (Pdf, Excel).

"How healthy is ash in the state?"
Average annual mortality by year

Average annual mortality of ash, about 7 million cubic feet from 2004 to 2008, has more than doubled since 1983 (Chart 5), mainly in proportion to the increase in volume. Mortality has remained statistically unchanged for the past 12 years.

The ratio of mortality to gross growth is about 14% for all ash species and is highest for black ash (Table 3). The average for all species in Wisconsin is 26% indicating that ash has a **lower ratio of mortality to growth than average**. Ash accounts for 6% of total volume and 7.5% of total growth in the state, but only 3.4% of mortality.

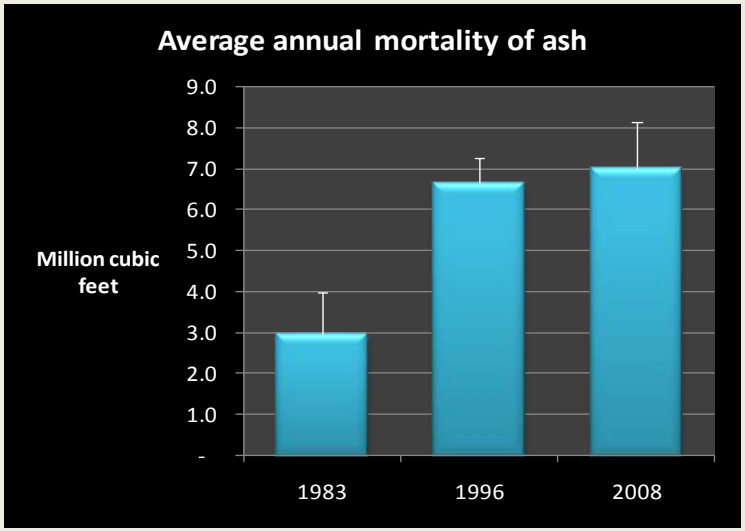


Chart 5. Average annual mortality (million cubic feet) by inventory year.
Source: USDA Forest Inventory & Analysis data: 1983, 1996, 2008

Table 3. Mortality, gross growth and the ratio of mortality to gross growth by species of ash.

Species	Average annual mortality (cft)	Average annual gross growth (cft)	Mortality/ growth
Black Ash	3,431,299	19,111,728	**18%**
Green Ash	1,595,881	16,226,025	**10%**
White Ash	1,967,138	15,473,148	**13%**
Total Ash	**6,994,318**	**50,810,901**	**14%**

Source: USDA Forest Inventory & Analysis data: 2008

Additional tables:
Average annual growth, mortality and removals by region (Pdf, Excel).

"How much ash do we harvest?"

Roundwood production by product and year

In 2003, Wisconsin produced about 13.4 million cft of ash roundwood or 3.2% of statewide production. Over half of this is for pulpwood and another third for sawlogs (Chart 6).

From 2003 to 2006, ash pulpwood had decreased by about 3.8 million cft or 40%.

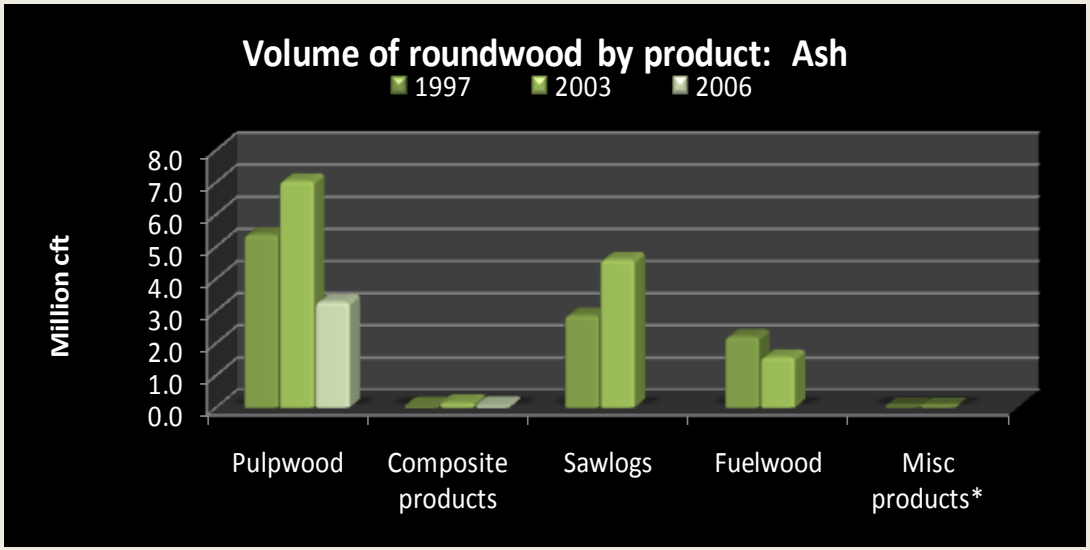


Chart 6. Volume of roundwood products. Numbers for pulpwood and composite products are from 2006. Numbers for sawlogs, fuelwood and miscellaneous products are from 2003 (Ron Piva).
* Miscellaneous products include poles, posts, pilings and veneer.
Source: Timber Products Output Mapmaker, http://ncrs2.fs.fed.us/4801/fiadb/rpa_tpo/wc_rpa_tpo.ASP

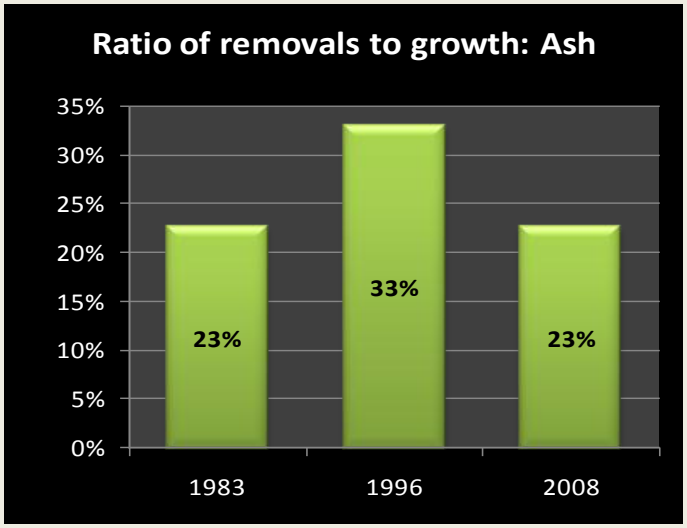


Chart 7. Ratio of volume harvested annually to new growth (2004 to 2008).
Source: USDA Forest Inventory & Analysis data: 1983, 1996, 2008.

The ratio of average annual removals of ash to annual net growth was 23% from 2004 to 2008 (Chart 7). This means that we are harvesting less than ¼ of total growth. Since 1996, the rate of removals decreased by 4% while growth rates increased 40%. The ratio of removals to net growth for ash is much less than the statewide ratio of 56% for all species.

Additional tables:
Average annual growth, mortality and removals by region (Pdf, Excel).

"How much is ash selling for?"

Prices for cordwood and sawtimber: 2000 to present

Due to the variability of timber prices from year to year and region to region, two methods of reporting prices are presented here: Timber Mart North and weighted average stumpage prices from the Wisconsin Administrative Code Chapter NR46.

Prices for cord and sawtimber products, as reported in the Timber Mart North (Chart 8), have generally declined since 2000.

Cordwood prices, reported in NR46 (Table 4), peaked in 2004 and have decreased since. Prices for logs peaked in 2006 and have decreased up to present. In 2009, pulpwood prices were above average and logs were below the mean.

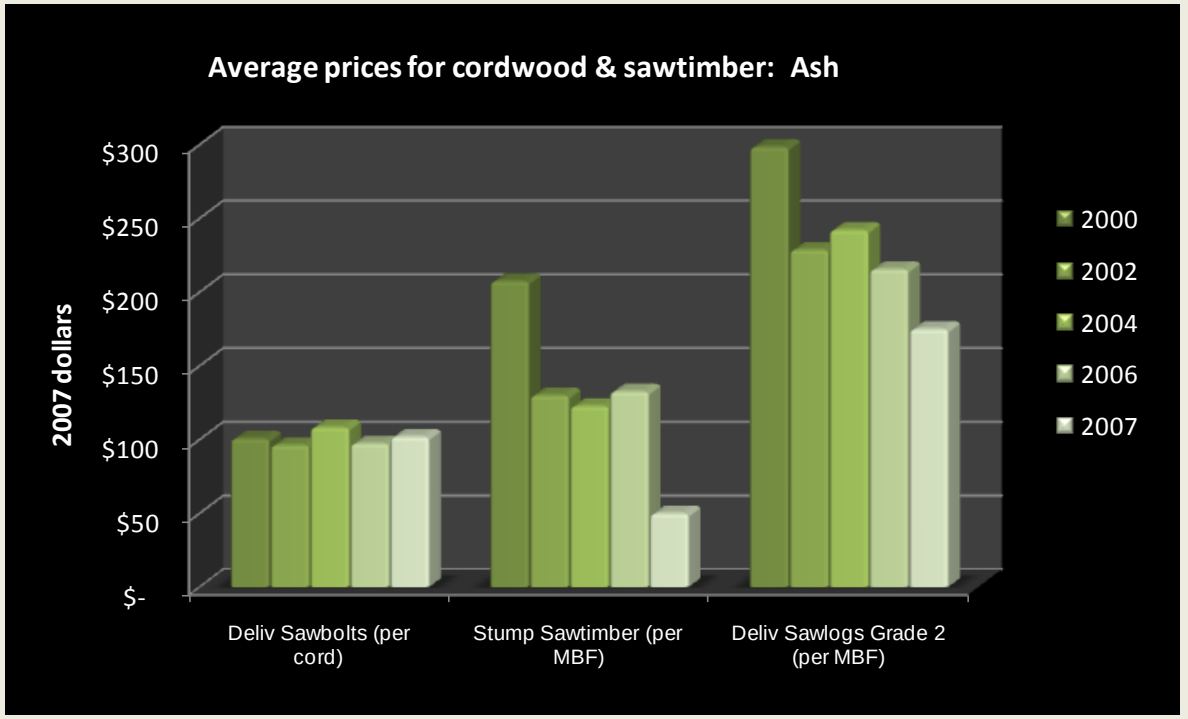
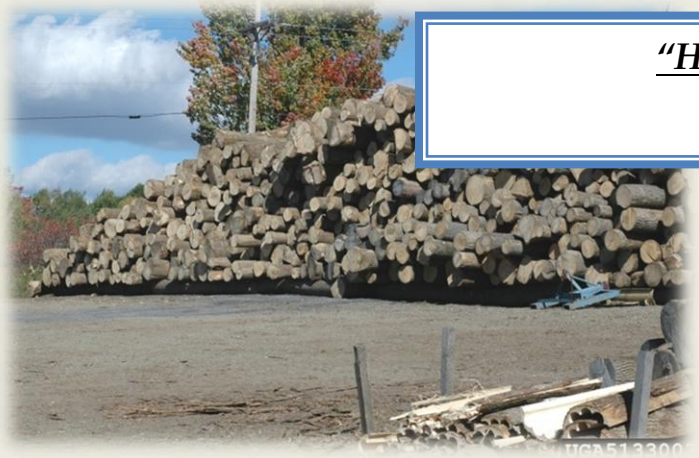


Chart 8. Average prices for cordwood and sawtimber for ash (2007).
Source: Timber Mart North, George Banzhaf & Company, 8301 N. Allen Lane, Milwaukee, WI 53217

Table 4. Average weighted stumpage prices by year for Wisconsin (adjusted for inflation to 2009 dollars).

Product	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Average for all hardwoods 2009
Cordwood (per cord)	NA	NA	NA	$29	$103	$47	$33	$42	NA	**$24**	$19
Logs (per MBF scribner)	$174	$168	$141	$147	$193	$191	$225	$165	$135	**$121**	$140

Source: Wisconsin Administrative Code Chapter NR46, 2000 to 2009



"How much ash biomass do we have?"

Oven-dry tons by region of the state

There were 40.2 million oven-dry tons (ODT) of ash biomass in 2008, up from about 30 million ODT, an increase of 55%, from 1983. This represents 6.8% of all live biomass statewide. As with volume, most of the ash is located in northwest Wisconsin (Chart 9).

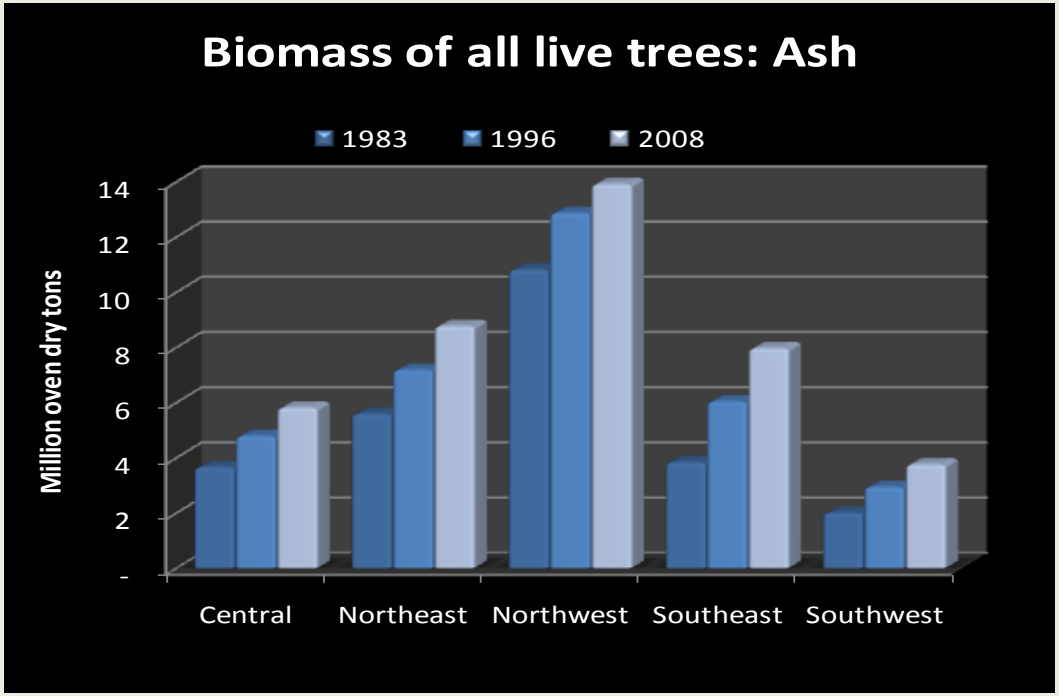


Chart 9. Biomass (million oven-dry tons) by year and region.
Source: USDA Forest Inventory & Analysis data: 1983, 1996, 2008

Ash is one of the denser hardwoods, with a ratio of biomass to volume of 51.6 oven-dry lbs. per cubic foot. The average for all trees is about 46.8 ODP/cft and 50.1 for hardwoods. Approximately 74% of ash above ground biomass is located in the main stem with 21% in branches.

Due to the high density and availability of its wood, ash may become a prominent species for biomass and biofuel production, especially if increased volumes become available due to EAB induced mortality.

Additional tables:
Biomass by county in 2008 (pdf; Excel)